TECHNICAL MEMORANDUM
NOVEMBER 2000 GROUNDWATER MONITORING REPORT

AMERICAN CHEMICAL SERVICE SUPERFUND SITE
GRIFFITH, INDIANA

Montgomery Watson File No. 2090603

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EXECUTIVE SUMMARY

The long term groundwater monitoring plan at the American Chemical Service, Inc. (ACS) National Priorities List (NPL) Site in Griffith, Indiana, consists of semi-annual sampling of the 44 wells in the monitoring network. In addition, three of the monitoring wells, MW48, MW49, and MW9R are sampled on a quarterly basis and up to five private wells in the vicinity of the Site are sampled once each year. For one of the semi-annual sampling events, the monitoring well samples are analyzed for the full Target Compound List (TCL) and Target Analyte List (TAL) parameters. For the other major sampling event, and the minor sampling events, the samples are analyzed for a reduced list of indicator parameters. Each quarter, water levels are measured at all monitoring network points in a single 24-hour period.

This Technical Memorandum summarizes the November 2000 groundwater monitoring activities at the ACS NPL Site. The November event consisted of a minor sampling event, plus the sampling of two additional wells, MW10C and ATMW-4D, for analysis of indicator volatile organic compounds (VOCs). The samples were analyzed for the reduced list of indicator parameters, and all samples and analyses were conducted in accordance with the September 1997 U. S. Environmental Protection Agency (U.S. EPA) approved sampling plan.

In the upper aquifer in the vicinity of the ACS facility, the regional groundwater flow is from east to west. At the ACS Site, the flow is diverted to the north and to the south by the barrier wall, installed as part of the ACS final remedy. The potentiometric surface to the northwest of the Site (including the wetland area) is relatively flat due to the effects of the Perimeter Groundwater Containment System (PGCS) trench, barrier wall, and discharge points from the groundwater treatment plant effluent. Depressed water levels in the Town of Griffith Landfill show evidence of the effect of their leachate collection system (LCS). In the lower aquifer, groundwater flow is northward with a hydraulic gradient of 0.00049. This gradient and flow direction are consistent with previous lower aquifer data presented in earlier groundwater technical memoranda.

Vertical gradients were calculated across the upper and lower aquifers and within the lower aquifer. All gradients were consistent with previous findings. Downward vertical gradients were observed between the upper and lower aquifer. Vertical gradients measured in the lower aquifer were small and variable; of the calculated gradients in the lower aquifer, four were downward and three were upward. Consistent vertical gradient trends are seen in three well nests within the lower aquifer: downward at MW52/MW53 and MW54R/MW55, and upward at MW9R/MW34. This variability indicates that there is not an overall trend in vertical gradient data in the lower aquifer.

Groundwater sampling within the upper aquifer was conducted at two monitoring wells, MW48 and MW49, during the November 2000 event. Detections of volatile organic compounds (VOCs) and inorganics were compared to the maximum baseline concentrations for each well. There were no exceedances of benzene or chloroethane in

these upper aquifer wells during November 2000. Arsenic and lead detections were also below baseline concentrations.

In the lower aquifer, three wells were sampled during November 2000. Detections of VOCs and inorganics were compared to the maximum baseline concentration for each well. Chloroethane and benzene concentrations in the groundwater sample from MW9R were below baseline concentrations and within the range of previous detections. The benzene concentrations appear to be continuing their downward trend since monitoring well MW9 was replaced. Benzene was detected above baseline concentrations in the groundwater sample from MW10C. Also, benzene and chloroethane concentrations at ATMW-4D have increased from the September 2000 sampling event. An action plan is being developed to address the increasing concentrations at ATMW-4D and MW10C. All other VOC detections were below baseline values. There were no exceedances of arsenic or lead in the samples from lower aquifer wells.

A separate report will be submitted that includes a discussion and data evaluation for the groundwater treatment system effluent samples.

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1.0 INTRODUCTION

1.1 LONG TERM GROUNDWATER MONITORING PLAN

The long-term groundwater monitoring plan, approved by U.S. Environmental Protection Agency (U.S. EPA) in September 1997, for the American Chemical Service, Inc. (ACS) National Priorities List (NPL) Site in Griffith, Indiana, consists of two major (semi-annual) sampling events each year and two minor sampling events. The major sampling events consist of sample collection at 44 monitoring wells in the monitoring network. For one of the semi-annual sampling events, the groundwater samples are analyzed for full scan Target Compound List and Target Analyte List (TCL/TAL) parameters. For the other semi-annual sampling event, the samples are analyzed for a reduced list of indicator parameters. The indicator parameters are tetrachloroethene (PCE), trichloroethene (TCE), 1,1,1-trichloroethane (TCA), 1,1-dichloroethene (DCE), 1,2-dichloroethene (1,2-DCE), vinyl chloride (VC), chloroethane, benzene, arsenic, and lead.

The minor sampling events consist of sampling three monitoring wells within the monitoring network, which have shown variable contaminant concentrations during the baseline sampling. These include upper aquifer monitoring wells MW48 and MW49, and lower aquifer monitoring well MW9R. Samples from these monitoring wells are analyzed for indicator parameters.

During each of the four annual sampling events, water levels are collected from the full monitoring network prior to collecting groundwater samples. These measurements are conducted within a 24-hour period and used to construct hydraulic gradient maps and tables.

Once annually, samples are to be collected from up to five private wells and analyzed for the full scan TCL/TAL parameters. This private well sampling has generally been conducted concurrently with the third groundwater monitoring event.

1.2 OBJECTIVES AND SCOPE OF NOVEMBER 2000 SAMPLING

The November 2000 sampling event was a minor sampling event, with sample collection at five monitoring wells. Samples from MW48, MW49, and MW09R were analyzed for the reduced list of indicator parameters, and samples from MW10C and ATMW-4D were analyzed for indicator VOCs only. The following objectives from the long term groundwater monitoring plan apply to the quarterly sampling at the ACS NPL Site.

1. Collect water level data to monitor groundwater flow in the upper and lower aquifers and calculate the hydraulic gradients between the aquifers.

2. Collect water level data to document the performance of the Perimeter Groundwater Containment System (PGCS) and Barrier Wall Extraction System (BWES) and to

evaluate changes in the groundwater flow system resulting from the remedial actions (these activities are outlined in the Performance Standard Verification Plan, April 1997). The Groundwater Treatment Plant Quarterly Monitoring Report is submitted under separate cover and includes information on this objective.

3. Collect and analyze groundwater samples from the interior of the areas of contaminated groundwater to document how concentrations change with time and in response to the remedial actions.

4. Assess progress toward attaining cleanup objectives in contaminated areas.

1.3 ORGANIZATION OF TECHNICAL MEMORANDUM

The results of the November 2000 groundwater monitoring activities at the ACS NPL Site are presented in the following sections of this report:

- Section 1 Objectives and scope of the groundwater monitoring activities
- Section 2 Field data collection activities
- Section 3 Evaluation of the November 2000 sampling data
- Section 4 Conclusions

Tables, figures and appendices are presented at the end of this report.

A baseline sampling report was completed following the September 1997 sampling event and included a long-term Groundwater Monitoring Plan. In accordance with the U.S. EPA-approved Groundwater Monitoring Plan, this Technical Memorandum compares the November 2000 groundwater analytical results to the highest detected concentrations observed for each well and parameter during the baseline sampling. This comparison table is found in Appendix A.

2.0 FIELD DATA COLLECTION ACTIVITIES NOVEMBER 2000

Field activities were conducted on November 17 and November 20, 2000 at the ACS Site. The groundwater monitoring activities were conducted in accordance with the U.S. EPA-approved Specific Operating Procedures (SOPs), the Pre-Design Quality Assurance Project Plan (QAPP) submitted in August 1995, and U.S. EPA comments regarding the Pre-Design QAPP. All monitoring wells were purged and sampled using low-flow methods in accordance with the approved Monitoring Well Sampling Proposal and Protocol SOP for the Upper Aquifer Investigation (Revision: July 25, 1996). The November 2000 groundwater sampling event consisted of the following activities:

- Measurement of water levels in 131 upper and lower aquifer wells, piezometers, and staff gauges on November 17, 2000. Of these measurements, 3 staff gauges were dry.
- Upper aquifer monitoring: collection of groundwater samples from two monitoring wells and analyses for indicator parameters on November 20, 2000.
- Lower aquifer monitoring: collection of groundwater samples from three monitoring wells and analysis for indicator parameters or indicator VOCs on November 20, 2000.

2.1 WATER LEVELS

Water level measurements were collected at upper and lower aquifer wells, piezometers, and surface water staff gauges on November 17, 2000. The water level measurements were utilized to determine horizontal gradients in the upper and lower aquifers, and to calculate vertical gradients between the aquifers, and within the lower aquifer. Table 1 contains water level measurements, map coordinates (reference points), top of inside well casing elevations, and calculated groundwater elevations for the measurement points.

2.2 GROUNDWATER SAMPLING

Prior to sampling the monitoring wells, each well was purged using low-flow methods in accordance with the U.S. EPA approved Monitoring Well Sampling SOP of the Upper Aquifer Investigation (revision: March 21, 1997). Field parameters (pH, specific conductivity, temperature, dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity) were measured and recorded during well purging activities. Table 2 presents a summary of the field parameter results.

The groundwater samples were sent overnight under chain-of-custody to CompuChem Laboratory, Cary, North Carolina, where they were analyzed for the indicator parameters summarized in Tables 3 and 4. The tables provide well identification, well screen depth (lower aquifer only), well location, and monitoring parameters.

3.0 EVALUATION OF NOVEMBER 2000 SAMPLING DATA

3.1 GROUNDWATER FLOW SYSTEM DATA

The groundwater elevations listed in Table 1 were used to develop water table and potentiometric surface maps for the upper and lower aquifers. Additionally, the horizontal hydraulic gradient was calculated for the lower aquifer, and vertical hydraulic gradients were calculated within the lower aquifer and between the upper and lower aquifers. The following sections present and discuss the general flow directions in the upper and lower aquifers and the calculated gradients.

3.1.1 Groundwater Flow in the Upper Aquifer

The upper aquifer matrix is homogeneous silty sand with no evidence of interlayering or bedding complexities. Many years of groundwater flow monitoring have shown that the natural regional groundwater flow in this aquifer is westward. The barrier wall, completed in 1997, has affected the groundwater flow by diverting it to the north-northwest and to the south-southeast.

Figure 1 presents the upper aquifer water table elevations from data collected on November 17, 2000. Due to the large number of data points (3 staff gauges, 22 wells, and more than 79 piezometers were used), little interpolation was required to develop detailed contour plots. Since the Remedial Investigation in 1991, all water table maps developed for the ACS Site have consistently shown the same general groundwater flow patterns. The gradient to the northwest of the site is relatively flat due to the affects of the PGCS trench, barrier wall, and discharge points from the groundwater treatment plant. Southwest of the Site, the water levels are depressed due to the effects of the Town of Griffith Landfill's leachate collection system. There was a groundwater low southeast of the site at monitoring well MW41. This has been observed in previous sampling events to be a very localized effect at well MW41, and appears to be the result of construction de-watering east of the well.

During review of the groundwater elevation data, it was discovered that the measurements for piezometers P97 and P98 seemed reversed, as the water level outside the barrier wall was higher. Historically, the water level inside the barrier wall has been higher. These measurements were re-checked and the water table inside the barrier wall was higher than outside. Therefore it was concluded that the depth-to-water measurements were inadvertently switched during measurement in the original field work and they have been corrected for Table 1 and Figure 1.

3.1.2 Groundwater Flow in the Lower Aquifer

Figure 2 presents the potentiometric surface map for the lower aquifer. The groundwater flow in the lower aquifer is northward, consistent with historical groundwater data. The horizontal hydraulic gradient in the lower aquifer was calculated using the measured difference in head between MW50, located south of the Site, and MW52, located northwest

of the Site in the wetlands. This difference, 1.18 feet on November 17, 2000, was divided by the lateral distance between the two wells (2,429 feet). Based on this calculation, the horizontal hydraulic gradient in the lower aquifer is 0.00049. This is consistent with the relatively low gradients historically calculated for the lower aquifer, as summarized below.

Report of Hydraulic Gradient in Lower Aquifer		Horizontal Hydraulic Gradient
Technical Memorandum	(October 1995)	0.00041
Lower Aquifer Tech Memo	(September 1996)	0.00047
Groundwater Monitoring Report	(August 1996)	0.00047
Groundwater Monitoring Report	(November 1996)	0.00049
Groundwater Monitoring Report	(March 1997)	0.00040
Groundwater Monitoring Report	(June 1997)	0.00044
Groundwater Monitoring Report	(September 1997)	0.00035
Groundwater Monitoring Report	(December 1997)	0.00039
Groundwater Monitoring Report	(June 1998)	0.00042
Groundwater Monitoring Report	(September 1998)	0.00029
Groundwater Monitoring Report	(December 1998)	0.00024
Groundwater Monitoring Report	(March 1999)	0.00033
Groundwater Monitoring Report	(June 1999)	0.00038
Groundwater Monitoring Report	(September 1999)	0.00035
Groundwater Monitoring Report	(November 1999)	0.00030
Groundwater Monitoring Report	(March 2000)	0.00039
Groundwater Monitoring Report	(June 2000)	0.00041
Groundwater Monitoring Report	(September 2000)	0.00041
November 2000 Groundwater Monitoring Report		0.00049
	Average	**0.00039**

3.1.3 Vertical Gradients in the Lower Aquifer

Seven nested well sets are screened in the lower aquifer. At each location, there are two or three monitoring wells and/or piezometers, each screened at a different depth within the lower aquifer. The depth intervals include the upper portion, the middle portion, and the lower portion.

The water level elevations (Table 1) were used to calculate vertical hydraulic gradients in the lower aquifer at each location. Table 5 summarizes the calculated vertical gradients from November 2000, which are shown in their historical context in the following tabulation:

Well/Piezometer Nest	Nov 1998	Mar 1999	June 1999	Sept 1999	Nov 1999	Mar 2000	June 2000	Sept 2000	Nov 2000
MW7/PZ44	WU	WU	WU	-0.0016	0.0064	-0.0016	-0.1208	WU	-0.0024
MW8/MW32	-0.0033	0.0011	-0.0007	0.0227	WU	0.0017	-0.0009	0.0013	-0.0007
MW9R/MW34	0.0006	WU	0.0037	0.0040	0.0037	0.0040	0.0035	0.0035	0.0035
MW30/MW33	WU	WU	-0.0058	WU	-0.0005	WU	-0.0063	-0.0016	0.0021
MW28/PZ43	0.0008	0.0011	0.0025	0.0140	0.0029	-0.0012	-0.0025	WU	0.0021
MW52/MW53	-0.0008	-0.0012	-0.0008	-0.0002	-0.0008	-0.0010	-0.0010	-0.0004	-0.0006
MW54R/MW55	NA	-0.0069	-0.0077	-0.0071	-0.0020	-0.0055	-0.0061	-0.0081	-0.0065

Notes: WU= Within uncertainty of measurement technique.
NA = A water elevation necessary for the calculation was not available.
Negative value indicates downward gradient.

Of the calculated vertical gradients across the lower aquifer, four were downward and three were upward. Consistent downward vertical gradients are observed at well nests MW52/MW53, and MW54R/MW55, and consistent upward vertical gradients are observed at well nest MW9R/MW34. This tabulation indicates a small, generally downward gradient at most locations.

3.1.4 Vertical Gradient Between Upper and Lower Aquifer

Water level elevations from upper and lower aquifer monitoring points were utilized to calculate the vertical hydraulic gradient between the two aquifers at three locations (P28/MW8, P27/MW9R, and P8/MW7). Vertical gradients were calculated by dividing the difference in head between the upper and lower aquifer wells by the thickness of the clay-confining layer between the two wells. These are summarized in Table 6. The gradients at these locations are consistent with previous findings. The results show that there is a relatively strong downward gradient from the upper aquifer to the lower aquifer.

3.2 MONITORING WELL SAMPLE DATA

Groundwater samples were collected from monitoring wells MW48, MW49, MW09R, MW10C, ATMW-4D during the November 2000 sampling event. All samples were analyzed for indicator VOC parameters (PCE, TCE, TCA, DCE, 1,2-DCE, VC, chloroethane, and benzene), with samples from monitoring wells MW48, MW49, and MW09R also analyzed for indicator metals (arsenic and lead). The laboratory results were validated in accordance with U.S. EPA Region V guidelines, *U.S. EPA Contract Laboratory Program National Functional Guidelines For Organic Data Review (1994)* and *Inorganic Data Review (1994)*. Validation narratives and laboratory analytical reports for samples from the upper aquifer and the lower aquifer are provided in Appendices C and D, respectively.

The analytical results for the November 2000 quarterly sampling were evaluated for evidence of contaminant migration, changes in contaminant concentrations over time in response to remedial actions, and the presence of contaminants in the lower aquifer. The analytical results are summarized in tabular form in Appendix A. Time trend plots for the five monitoring wells are presented in Appendix B. The following sections summarize the results of the organic analyses in the upper aquifer (Section 3.2.1), the organic analyses in the lower aquifer (Section 3.2.2), and the inorganic analyses in both aquifers (Section 3.2.3).

3.2.1 Groundwater Sampling Results in the Upper Aquifer

The Site source areas are currently contained within the barrier wall, which prevents migration of contaminants to adjacent areas. Because of this, the groundwater monitoring program is focused on the adjacent areas not confined by the barrier wall. These surrounding areas are: the areas north and west of the ACS Facility, referred to as the North Area; the area south/southeast of Colfax Avenue, referred to as the South Area; and the Town of Griffith Landfill, which covers the area to the southwest of the ACS Site. For this

minor sampling event, two upper aquifer wells, MW48 and MW49, located within the plume in the North Area, were sampled. Table 8 presents a summary of indicator organic compounds detected in groundwater samples collected from these two upper aquifer wells.

3.2.1.1 VOCs

The impact to groundwater in the North Area is comprised primarily of chloroethane and benzene. These compounds were detected in interior wells MW48 and MW49, but did not exceed maximum baseline concentrations during the November 2000 sampling event. Furthermore, concentrations of benzene and chloroethane in these wells continue to show decreasing trends. Trans-1,2-dichloroethene (tDCE) was detected at estimated concentrations in MW49 (1 µg/L). No other VOCs were detected during this sampling event. Figure 3 summarizes the VOC detections in samples from monitoring wells MW48 and MW49 on a map of the ACS Site. Time trend plots for these compounds are found in Appendix B. The following table summarizes historical benzene and chloroethane detections in MW48 and MW49:

Monitoring Wells MW48 and MW49 (Upper Aquifer)

Monitoring Well	MW48		MW49	
Sampling Date	Benzene	Chloroethane	Benzene	Chloroethane
Baseline Value	9,500	1,000	6,750	715
August 1996	9,100	1,000	5,000	480
March 1997	5,200	620	1,600	310
June 1997	7,700	670	4,800	540
September 1997	9,500	980	8,200	810
December 1997	3,800	300	3,300	250
June 1998	9,500	720	4,500	450
September 1998	7,800	610	4,700	650
December 1998	5,500	420	4,200	440
March 1999	1,900	83	1,900	180
June 1999	5,700	290	2,600	220
September 1999	5,400	290	2,200	210
November 1999	2,400	140	2,400	260
March 2000	220	24	530	91
June 2000	3,800	160	ND	ND
September 2000	4,100	100	630	220
November 2000	1,100	78	610	190

All concentrations in micrograms per liter (ug/L)
ND = Not detected

3.2.1.2 SVOCs

Semivolatile organic compounds (SVOCs) were not analyzed as part of the November 2000 groundwater monitoring activities within the upper aquifer in accordance with the approved Groundwater Monitoring Plan.

3.2.1.3 Pesticides and PCBs

Pesticides and PCBs were not analyzed as part of the November 2000 groundwater monitoring activities within the upper aquifer in accordance with the approved Groundwater Monitoring Plan.

3.2.1.4 Tentatively Identified Compounds (TICs)

Two VOC tentatively identified compounds (TICS) were detected in upper aquifer monitoring well MW49 during the November 2000 sampling event. Diethyl sulfide and 3,3,5-trimethcyclohexanone were detected at low, estimated concentrations. The TIC results are compiled in Appendix C with the analytical results.

3.2.2 Groundwater Sampling Results from the Lower Aquifer

Table 8 presents a summary of indicator organic compounds detected in groundwater samples collected from three lower aquifer monitoring wells during the November 2000 sampling event.

3.2.2.1 VOCs

Benzene and chloroethane were the only VOCs detected during the November 2000 sampling event, and both compounds were detected at all three monitoring wells ATMW-4D, MW09R, and MW10C. Figure 4 summarizes the VOC detections in groundwater samples collected from lower aquifer monitoring wells on a map of the ACS Site. Below is a discussion of these detections.

Monitoring Well MW09/MW09R

Benzene and chloroethane concentrations at MW09R were below maximum baseline concentrations in November 2000. Benzene concentrations have decreased over the last several sampling events. Chloroethane concentrations have decreased since September 2000, but prior to that have increased over the last few sampling events. The following tabulation shows how the concentrations of benzene and chloroethane have decreased since the original MW09 was replaced with MW09R:

Sampling Date	Benzene	Chloroethane
Baseline Value	310	2900
March 1997	310	2900
June 1997	280	1700
September 1997	290	1800
December 1997	260	2000
June 1998*	110	1400
September 1998*	100	2000
December 1998*	160	2300
March 1999*	130	760
June 1999*	160	490
September 1999*	120	650
(Cont.)		

Sampling Date	Benzene	Chloroethane
Baseline Value	310	2900
November 1999*	160	540
March 2000*	120	460
June 2000*	60	660
September 2000*	65	970
November 2000*	55	710

All concentrations in micrograms per liter (ug/L)

*Sample collected from replacement well MW09R

Monitoring Well MW10C

Benzene concentrations at MW10C exceeded the maximum baseline concentrations in the November 2000 sampling event. Concentrations of benzene and chloroethane have commonly fluctuated over the last several years. However, concentrations of benzene have increased significantly over the last few sampling events. The following tabulation shows the historical concentrations of benzene and chloroethane at MW10C.

Sampling Date	Benzene	Chloroethane
Baseline Value	150	420
May 1990	ND	ND
January 1995	ND	ND
November 1996	ND	120
March 1997	ND	140
June 1997	ND	440
September 1997	ND	420
December 1997	ND	160
June 1998	ND	160
December 1998	66	150
June 1999	2,000	2,600
September 1999	83	88
November 1999	340	360
March 2000	120	180
June 2000	150	160
September 2000	520	630
November 2000	1800	140

All concentrations in micrograms per liter (ug/L)

ND = Not detected

Monitoring Well ATMW-4D

Monitoring well ATMW-4D was installed in September 1985 by ACS, Inc. This well was not included in the baseline sampling events and therefore there is no baseline for comparison. It has now been sampled six times since 1998, and concentrations of benzene in the groundwater samples from this well have increased significantly since March 2000. Benzene and chloroethane have continued to increase since September 2000. An action plan is being prepared to respond to ATMW4D, as well as MW10C, which is located

downgradient of ATMW-4D (Figure 4). It will be submitted to the U.S. EPA in February 2001. Below is a tabulation showing the sampling results for monitoring well ATMW-4D:

Sampling Date	Benzene	Chloroethane
December 1998	ND	ND
June 1999	ND	ND
November 1999	3	9
March 2000	12	34
September 2000	1,200	88
November 2000	3,500	120

All concentrations in micrograms per liter (ug/L)
ND = Not detected

3.2.2.2 SVOCs

Semivolatile organic compounds (SVOCs) were not analyzed as part of the November 2000 groundwater monitoring activities within the lower aquifer in accordance with the approved Groundwater Monitoring Plan.

3.2.2.3 Pesticides and PCBs

Pesticides and PCBs were not analyzed as part of the November 2000 groundwater monitoring activities within the lower aquifer in accordance with the approved Groundwater Monitoring Plan.

3.2.2.4 Tentatively Identified Compounds (TICs)

One VOC TIC was detected in the groundwater sample from lower aquifer monitoring well MW10C during November 2000. Ether was detected at a concentration of 1,500 µg/L, which is consistent with previous TIC sampling results from this well. No other VOC TICs were detected during the November 2000 sampling event. The TIC results are compiled in Appendix D with the analytical results.

3.2.3 Inorganic Chemical Species

Monitoring wells MW48, MW49, and MW09R were sampled and analyzed for indicator metals (arsenic and lead) during the November 2000 sampling event. The results were compared to the maximum baseline concentrations, which are compiled in Appendix A. Arsenic was detected in the groundwater sample from monitoring well MW49 at concentrations below the maximum baseline concentration. There were no other detections of arsenic or lead at the other wells. Since only indicator parameters (arsenic and lead) were analyzed during the November 2000 sampling event, the full comparative evaluation for significance will not be completed for these results.

4.0 CONCLUSIONS

The following conclusions can be drawn for each objective of the Groundwater Monitoring Plan.

Objective 1 was to collect water level data to monitor groundwater flow in the upper and lower aquifers and calculate the hydraulic gradients between the aquifers. The data collected indicates that groundwater flow directions and groundwater gradients for the November 2000 sampling event are consistent with past conditions for both the upper and lower aquifers.

Objective 2 was to collect water level data to document the performance of the PGCS and BWES and to evaluate changes in the groundwater flow system resulting from the remedial actions. The data indicate the barrier wall is containing the groundwater enclosed within the wall. In general, groundwater flow from the east is diverted toward the north/northwest and south/southwest. The groundwater diverted north/northwest is either collected in the PGCS extraction trench or continues to the wetlands. Groundwater diverted south/southwest flows along the barrier wall towards the southwest. These observations are consistent with previous observations.

Objective 3 was to collect and analyze groundwater samples from the interior of the areas of contaminated groundwater to document how concentrations change with time and in response to the remedial actions. Analytical results for samples collected from North Area upper aquifer wells MW48 and MW49 indicate that concentrations of benzene and chloroethane have decreased over the past several sampling events. Inorganic baseline exceedances are not considered significant at this time since no trends have been seen related to site activities. In the lower aquifer well MW10C, benzene exceeded baseline concentrations, and at ATMW-4D, benzene and chloroethane concentrations have shown significant increases over the last few sampling events.

Objective 4 was to assess progress toward attaining cleanup objectives in the contaminated areas. Concentrations of benzene and chloroethane in MW48 and MW49 have decreased over the past several monitoring events, and may be related to ORC injection and the fact that the barrier wall contains the original source material.

In summary, groundwater elevation data at the ACS Site indicate that no significant changes have occurred in the groundwater flow directions at the Site. The groundwater monitoring data at the ACS Site demonstrate that the BWES is working to contain contaminants inside the barrier wall, that contamination outside of the barrier wall has not migrated beyond its historical extent, and that concentrations in contaminated areas outside of the barrier wall have decreased in several areas. While some sample results show variability, most are below baseline values or show decreasing concentration trends. Sample results from the North Area show that the BWES, PGCS, and ORC are resulting in reduced concentrations in the upper aquifer.

However, recent changes in concentrations in the lower aquifer at ATMW-4D and MW10C are of interest. A separate action plan is being developed to propose further investigation of this area.

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Table 1
Groundwater Level Gauging Points - November 2000
American Chemical Service NPL Site
Griffith, Indiana

Upper Aquifer Wells

Well Designation	Reference Points			11/17/00		Notes
	East	North	TOIC	level	Elevation	
MW6	5298	5520	655.28	24.16	631.12	
MW11	6377	7329	640.47	8.61	631.86	
MW12	6019	6352	642.74	10.80	631.94	
MW13	5050	7814	634.08	3.62	630.46	
MW14	4882	6995	638.56	10.02	628.54	
MW15	4721	5003	637.89	7.42	630.47	
MW18	5836	5746	644.89	10.90	633.99	
MW19	5231	4943	635.78	5.15	630.63	
MW37	5395	7976	636.78	6.32	630.46	
MW38	5903	8216	636.51	6.25	630.26	
MW39	6253	7947	637.77	6.39	631.38	
MW40	6349	6831	639.46	7.32	632.14	
MW41	6242	4517	632.74	6.80	625.94	
MW42	6264	3808	632.32	4.95	627.37	
MW43	5880	3719	633.56	6.10	627.46	
MW44	5390	4303	633.04	4.11	628.93	
MW45	5830	4388	635.35	6.65	628.70	
MW46	4526	7424	633.32	2.92	630.40	
MW47	5958	5084	640.54	7.87	632.67	
MW48	5669	7814	636.36	5.65	630.71	
MW49	5551	7650	637.00	6.39	630.61	
M1S	4362	5743	639.09	7.80	631.29	Griffith Landfilll Wells
M4S	4953	6537	633.42	3.15	630.27	Griffith Landfilll Wells

Staff Gauges

Well Designation	Reference Points			11/17/00		Notes
	East	North	TOSG	level	Elevation	
SG2	4423	6864	622.84	NM	NM	Does Not Exist - Covered by landfill
SG7	5403	6889	637.01	2.2	634.8	
SG8R	5409	5252	634.70	NM	NM	Dry - 3.10' to ground
SG1	5023	6196	633.50	NM	NM	Does Not Exist
SG3	4180	7123	631.17	NM	NM	Could not access due to fence and high river
SG5	5464	7713	633.36	3.19	630.17	
SG6	4495	8075	632.97	2.45	630.52	
SG11	5859	8245	634.62	NM	NM	Dry - 3.22' to ground
SG12	5596	7867	634.12	NM	NM	Dry - 3.42' to ground

Notes:
All depth measurements and elevations are in units of feet.
Elevation is in feet above mean sea level.
TD = total depth
TOIC = top of inner casing
TOSG = top of staff gauge
NM = not measured (reason given under "Notes" column)

Table 1
Groundwater Level Gauging Points - November 2000
American Chemical Service NPL Site
Griffith, Indiana

Lower Aquifer Wells and Piezometers

Well Designation	Reference Points			11/17/00		Notes
	East	North	TOIC	Level	Elevation	
MW28	5657	5696	648.77	26.98	621.79	
PZ42	5662	5696	648.44	26.70	621.74	
PZ43	5662	5702	648.69	26.85	621.84	
MW50	5269	5383	649.43	27.58	621.85	
PZ44	6170	6766	638.47	17.20	621.27	
MW7	6113	6732	641.46	20.16	621.30	
MW10C	5229	7554	637.45	NM	NM	Could not measure due to pump in well.
MW9R	4893	6990	639.05	17.99	621.06	
MW29	4886	7012	638.06	16.85	621.21	
MW34	4880	7002	638.14	16.91	621.23	
MW23	4717	7404	633.31	12.30	621.01	
MW24	4596	8033	635.22	14.62	620.60	
MW52	4996	7814	632.74	12.07	620.67	
MW53	4977	7833	632.87	12.23	620.64	
MW51	5198	7767	634.16	13.71	620.45	
MW30	5194	7774	634.25	13.66	620.59	
MW33	5189	7774	634.13	13.50	620.63	
MW54R	5590	7592	637.51	16.58	620.93	
MW55	5595	7604	636.63	16.03	620.60	
MW8	5934	7506	640.43	19.56	620.87	
MW31	5907	7505	641.64	20.76	620.88	
MW32	5902	7507	641.84	21.00	620.84	
M4D	4949	6538	633.32	12.05	621.27	
ATMW4D	5297	7311	637.99	16.96	621.03	

Notes:
All depth measurements and elevations are in units of feet.
Elevation is in feet above mean sea level.
TOIC = top of inner casing

Table 1
Groundwater Level Gauging Points - November 2000
American Chemical Service NPL Site
Griffith, Indiana

Piezometers

Well Designation	Reference Points			11/17/00		Notes
	East	North	TOC	level	Elevation	
LW1	4807	5070	644.57	13.77	630.80	
LW2	4662	5465	649.70	18.84	630.86	
P3	5453	6470	639.87	5.35	634.52	
P5	5285	6510	636.70	4.96	631.74	
P7	5950	6630	643.63	11.64	631.99	
P8	6156	6734	639.27	7.22	632.05	
P9	6134	6994	638.88	6.96	631.92	
P10	5413	5852	649.32	15.09	634.23	Strong odor
P11	5199	5900	649.14	14.80	634.34	NAPL thickness = 0.5"
P13	4878	5735	651.20	19.85	631.35	
P15	5003	6187	639.93	8.50	631.43	
P16	4673	5749	648.80	17.10	631.70	
P17	4584	6006	654.64	23.70	630.94	Inside Griffith Landfill
P22	4636	6732	634.30	5.56	628.74	
P23	4689	7018	636.18	6.65	629.53	
P24	5002	7178	636.06	7.10	628.96	
P25	5131	7510	635.01	5.01	630.00	
P26	4764	7309	634.23	4.02	630.21	
P27	4904	7020	639.70	11.16	628.54	
P28	5883	7486	644.53	13.39	631.14	
P29	5738	6619	642.37	8.30	634.07	
P31	5480	7159	641.03	5.45	635.58	
P32	5746	7026	642.32	8.03	634.29	
P36	5410	6851	645.89	11.29	634.60	
P39	5940	6902	642.00	8.00	634.00	
P40	5931	7241	638.77	6.86	631.91	
P41	5663	7377	637.23	5.44	631.79	
P49	5145	6949	638.98	4.76	634.22	
P51	3876	6859	635.07	NM	NM	Could not access due to river
P52	4100	7845	636.66	6.61	630.05	
P53	4597	8015	636.18	5.71	630.47	
P54	4936	8081	638.28	7.69	630.59	
P55	5628	7979	636.08	5.96	630.12	
P56	6405	7665	639.46	7.79	631.67	
P59	6389	6590	639.22	6.59	632.63	
P60	6111	6051	640.23	8.00	632.23	
P61	5533	5284	638.58	6.70	631.88	Hit by mower - Bent riser
P62	5665	4945	637.06	NM	NM	Hit by mower - obstructed
P63	5483	7689	637.70	7.34	630.36	
P64	4617	7065	634.87	4.96	629.91	
P65	4615	7063	634.77	4.76	630.01	
P66	4729	7034	636.02	6.70	629.32	
P67	4732	7034	636.06	6.73	629.33	
P68	4743	7752	634.48	3.78	630.70	
P69	4741	7751	634.66	3.92	630.74	
P70	4880	7680	635.38	4.84	630.54	
P71	4876	7682	635.32	4.60	630.72	

Notes:
All depth measurements and elevations are in units of feet.
Elevation is in feet above mean sea level.
TOC = top of casing
NM = not measured (reason given under "Notes" column)
Piezometers P4, P6, P12, P18, P30, P35, P37, P38, P50, and EW1 are destroyed

Table 1
Groundwater Level Gauging Points - November 2000
American Chemical Service NPL Site
Griffith, Indiana

New Piezometers - Upper Aquifer

Well Designation	Reference Points			11/17/00		Notes
	East	North	TOC	level	Elevation	
PGCS Piezometer Sets						
P81	5577	7581	636.19	5.80	630.39	
P82	5577	7572	635.77	5.40	630.37	
P83	5577	7562	635.95	5.64	630.31	
P84	5322	7603	634.35	4.35	630.00	
P85	5326	7594	634.08	4.14	629.94	
P86	5329	7585	634.41	4.63	629.78	
P87	5121	7466	633.88	3.94	629.94	
P88	5130	7460	633.90	4.18	629.72	
P89	5137	7454	634.02	4.31	629.71	
P90	4881	7152	632.59	4.22	628.37	
P91	4889	7145	632.97	6.04	626.93	
P92	4896	7138	633.63	5.40	628.23	
BWES Piezometer Pairs						
P93	5136	7067	638.79	NM	NM	Could not find. Possibly covered by gravel.
P94	5146	7061	638.98	NM	NM	Destroyed
P95	5146	6532	638.58	7.07	631.51	
P96	5156	6537	638.39	4.19	634.20	
P97	5098	6283	638.39	7.94	630.45	Strong odor - Values for P97 and P98 were switched
P98	5130	6279	639.35	6.39	632.96	Strong odor - Values for P97 and P98 were switched
P99	5020	5945	644.35	12.83	631.52	
P100	5031	5948	643.93	9.83	634.10	
P101	5550	5979	650.08	18.40	631.68	
P102	5517	5996	647.18	12.59	634.59	
P103	5672	6248	644.97	13.51	631.46	
P104	5639	6267	646.68	12.46	634.22	
P105	5885	6678	638.86	6.70	632.16	
P106	5871	6685	638.10	4.79	633.31	
P107	5766	7339	637.42	6.27	631.15	
P108	5757	7324	638.13	4.11	634.02	
ORC Piezometers						
ORC PZ1	5685	7574	638.57	7.80	630.77	
ORC PZ2	5758	7457	643.43	12.23	631.20	
ORC PZ3	5760	7540	640.24	9.15	631.09	
ORC PZ4	5827	7502	643.79	12.55	631.24	
ORC PZ5	5741	7753	636.21	5.38	630.83	
ORC PZ6	5759	7792	636.13	5.28	630.85	
ORC PZ7	5792	7839	635.85	5.06	630.79	
ORC PZ8	5813	7763	638.16	7.26	630.90	

Notes:
All depth measurements and elevations are in units of feet.
Elevation is in feet above mean sea level.
TD = total depth
TOC = top of casing
NM = not measured (reason given under "Notes" column)

Table 2
Summary of Field Parameter Results - November 2000
American Chemical Service Superfund Site
Griffith, Indiana

Well ID	Field Parameters					
	pH (std. units)	Conductivity (S/m)	Temperature (^{0}C)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)
MW09R	6.85	0.104	12.8	54	0.0	-110
MW10C	6.95	0.160	12.7	240	1.66	-126
MW48	6.70	0.092	12.9	44	0.0	-102
MW49	6.76	0.070	12.7	0	0.0	-144
ATMW4D	6.98	0.106	11.9	24	0.0	-126

Notes:
NTU = nephelometric turbidity units
S/m = Siemers per meter
mg/l = milligrams per liter
mV = millivolts

Table 3
Upper Aquifer Wells Sampled - November 2000
American Chemical Service Superfund Site
Griffith, Indiana

	Area of Groundwater Contamination	Well Identification	Location with Respect to Area of Groundwater Contamination	Monitoring Parameters November 2000
1	North	MW48	Internal	IND
2		MW49	Internal	IND

Notes:
IND: Arsenic, lead, VC, benzene, chloroethane, TCE, PCE, TCA, DCE, and 1,2-DCA.

Table 4
Lower Aquifer Wells Sampled - November 2000
American Chemical Service Superfund Site
Griffith, Indiana

	Well Identification	Well Screen Depth in Lower Aquifer	Location with Respect to Area of GW Contamination	Monitoring Parameters November 2000
1	MW10C	Upper	Internal	IND - VOCs only
2	MW9R	Upper	Internal	IND
3	ATMW-4D	Upper	ACS Site	IND - VOCs only

Notes:
IND: Arsenic, lead, VC, benzene, chloroethane, TCE, PCE, TCA, DCE, and 1,2-DCA.

Table 5
Vertical Gradients in Lower Aquifer - November 2000
American Chemical Service, Inc. NPL Site
Griffith, Indiana

Well	Screen Interval		Separation	Lowest Measurable	Groundwater Elevation				Vertical Gradients		
Nest	Top	Bottom	(feet)	Gradient	Upper	Middle	Lower	delta	Upper/ Middle	Middle/ Lower	Upper/ Lower
MW7	595.9	590.9			621.30						
PZ44	578.4	573.4	13	0.0008		621.27		-0.03	-0.0024	NA	NA
MW8	598.2	593.2			620.87						
MW31	574.6	564.6	19	0.0005		620.88		0.01	WU		
MW32	547.3	537.3	17	0.0006			620.84	-0.04		-0.0023	-0.0007
MW9R	605.9	600.9			621.06						
MW29	585.9	575.9	15	0.0007		621.21		0.15	0.0100		
MW34	552.8	542.8	23	0.0004			621.23	0.02		0.0009	0.0035
MW30	585.0	575.0	13	0.0008		620.59			NA		
MW33	556.0	546.0	19	0.0005			620.63	0.04		0.0021	NA
MW28	588.7	578.7			621.79						
PZ42	568.5	563.5	10	0.0010		621.74		-0.05	-0.0049		
PZ43	554.5	549.5	9	0.0011			621.84	0.1		0.0111	0.0021
MW52	615.6	605.6			620.67						
MW53	555.7	545.7	50	0.0002			620.64	-0.03	NA	NA	-0.0006
MW54R	608.1	598.1			620.93						
MW55	547.6	537.6	51	0.0002			620.60	-0.33	NA	NA	-0.0065

Notes:
Water level measurements collected on September 18, 2000.
Elevation is in feet above mean sea level.
NA = Not Applicable. Calculating vertical gradient only for upper/lower interval at this location.
WU = Within uncertainty of measurement technique.
(-) = Downward Gradient
(+) = Upward Gradient
See *September 1997 Groundwater Sampling Results Report and Groundwater Monitoring Plan* (July 1998), p. 4, for an explanation of cal method.

Table 6
Vertical Gradients Between Upper and Lower Aquifers - November 2000
American Chemical Service Superfund Site
Griffith, Indiana

Well Designation	Screen Interval		Screen Midpoint	Separation (feet)	Groundwater Elevation			Hydraulic Gradient
	Top	Bottom			Upper	Lower	delta	
P28	634.30	629.30	631.80	11	631.14			
MW8	598.20	593.20	595.70			620.87	-10	-0.93
P27	631.02	626.02	628.52	23	628.54			
MW9R	605.90	600.90	603.40			621.06	-7	-0.33
P8	635.36	630.36	632.86	18	632.05			
MW7	595.90	590.90	593.40			621.30	-11	-0.60

Notes:
Water level measurements collected on September 18, 2000.
Elevation is in feet above mean sea level.
(-) = Downward Gradient
(+) = Upward Gradient
See *September 1997 Groundwater Sampling Results Report and Groundwater Monitoring Plan* (July 1998), p. 4, for an explanation of calculation method.

CAS/cas/RDC
J:\209\0603 ACS\November 2000\202090603a08b[Table 6]
2090603.030401

Table 7
Summary of Organic Compound Detections in the Upper Aquifer
Validated Results - November 2000
American Chemical Service Superfund Site
Griffith, Indiana

Parameter	MW-48			MW-49		
	Nov-00		BV	Nov-00		BV
VOCs (ug/L)						
Benzene	1,100	D/	9,500	610	D/	6,750
Chloroethane	78		1,000	190	D/	715
trans-1,2-Dichloroethene				1	J/	NA

Notes:
ug/L = micrograms per liter
BV = Baseline Value
_/_ = No data qualifier required
J/_ = Data qualifier added by laboratory
_/J = Data qualifier added by data validator
Data qualifers are defined in Appendix C.
D = Results based on diluted sample
J = Estimated value
A blank cell indicates the parameter was not detected.
Bold result indicates an exceedance of BV

Table 8
Summary of Organic Compound Detections in the Lower Aquifer
Validated Results - November 2000
American Chemical Service Superfund Site
Griffith, Indiana

Parameter	ATMW-4D			MW-09R			MW-10C		
	Nov-00		BV	Nov-00		BV	Nov-00		BV
VOCs (ug/L)									
Benzene	3,500	D/	NS	55	J/	310	**1800**	D/	150
Chloroethane	120		NS	710		2,900	140		420

Notes:

ug/L = micrograms per liter.

BV = Baseline Value

_/_ = No data qualifier required

J/_ = Data qualifier added by laboratory

_/J = Data qualifier added by data validator

D = Results based on diluted sample

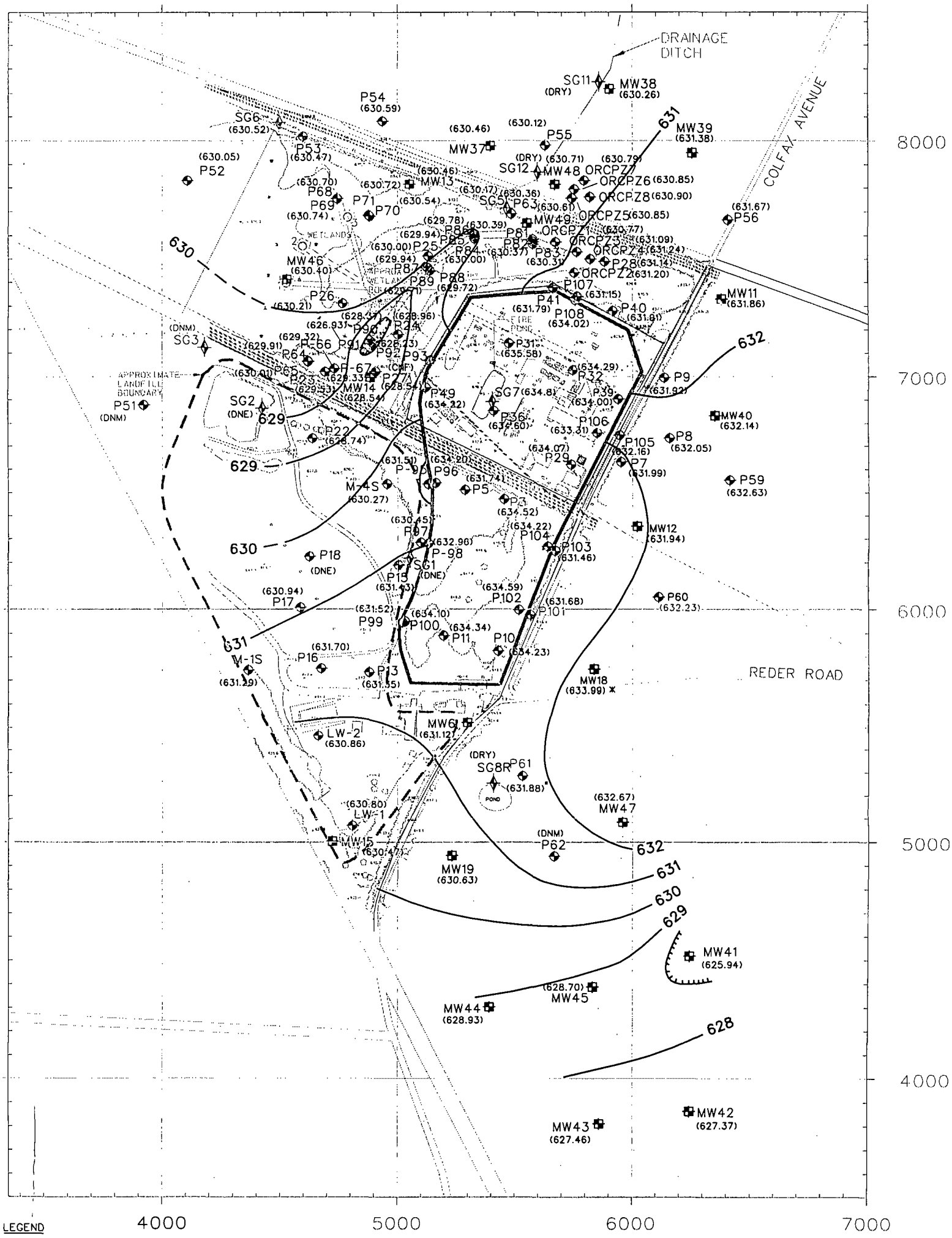
J = Estimated value

Data qualifiers are defined in Appendix C

A blank cell indicates parameter not detected.

Bold result indicates an exceedance of BV

CAS/cas/RDC
J:\209\0603 ACS\November 2000\202090603a14
2090603.030401



LEGEND

- UPPER AQUIFER WELL LOCATION AND DESIGNATION
- P61 — PIEZOMETER LOCATION AND DESIGNATION
- STAFF GAUGE LOCATION AND DESIGNATION
- O^3 — SURFACE DISCHARGE LOCATION FOR PERIMETER GROUND WATER CONTAINMENT SYSTEM
- ORCPZ1 — ORC PIEZOMETER LOCATION AND DESIGNATION
- (632.00) — GROUNDWATER ELEVATION
- (632.00) * — GROUNDWATER ELEVATION MEASURED BUT NOT USED FOR DETERMINATION OF THE POTENTIOMETRIC SURFACE
- (DNM) — DID NOT MEASURE
- (DNE) — DOES NOT EXIST

630 —— GROUNDWATER ELEVATION CONTOUR BASED ON GROUNDWATER ELEVATION DATA (DASHED WHERE INFERRED)

BARRIER WALL

PERIMETER GROUND WATER CONTAINMENT SYSTEM

NOTES

1. GROUNDWATER ELEVATIONS FOR WATER TABLE CONTOURS WERE MEASURED AT THE SITE ON NOVEMBER 17, 2000.

N

0 500 1000

SCALE IN FEET

REV	DATE	BY	DESCRIPTION

DESIGNED — CAS — DATE 2/28/2001
CHECKED — SAF — DATE 3/5/2001
APPROVED — PJV — DATE 3/6/2001

SCALE AS SHOWN

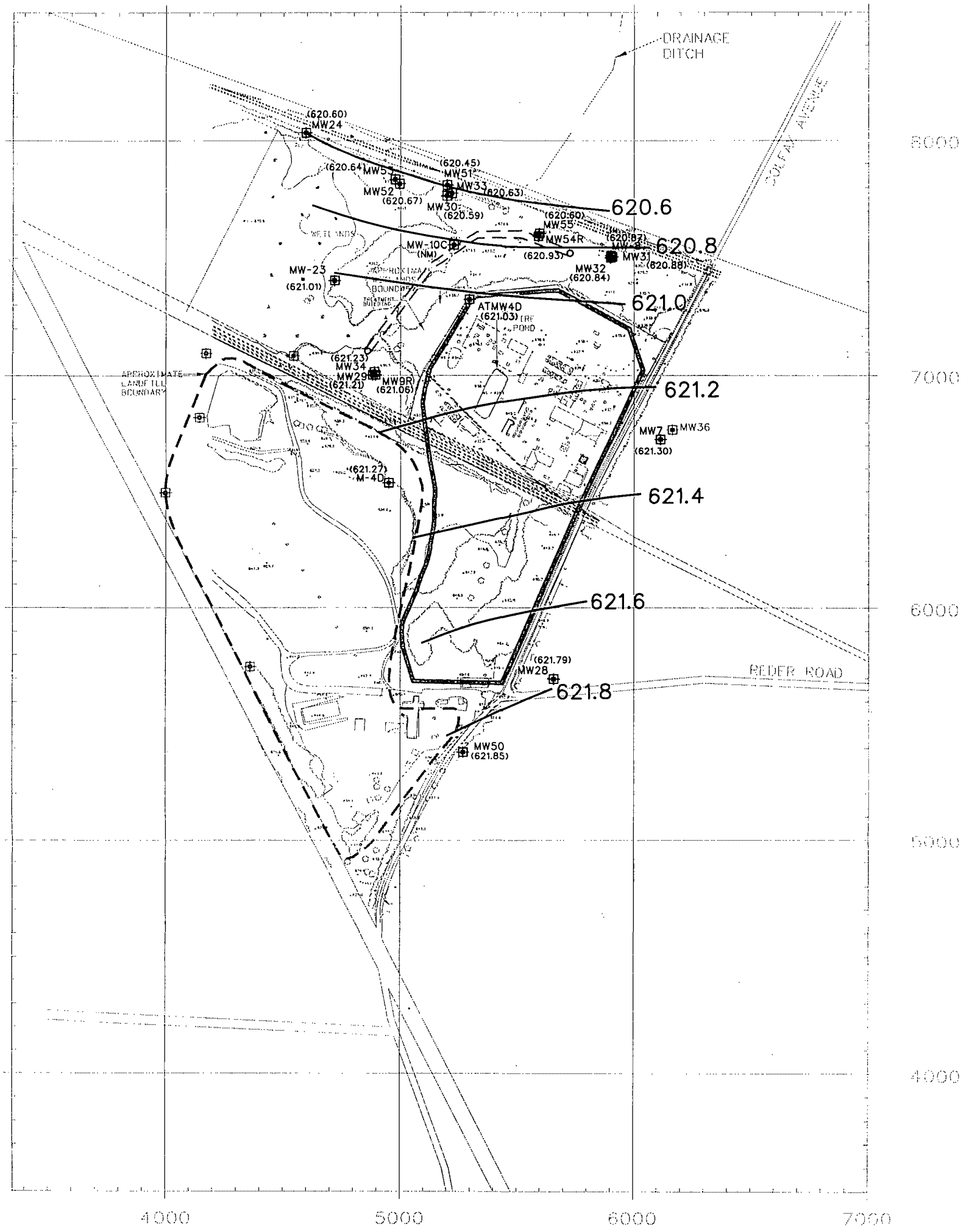
MONTGOMERY WATSON
Chicago, Illinois

AMERICAN CHEMICAL SERVICES, INC.
NPL SITE
GRIFFITH, INDIANA

UPPER AQUIFER WATER TABLE MAP
NOVEMBER 2000

1

JOB No. 2090603 FILE: J:/209/0603 acs/november 2000/upper_contour5d_1.dgn



LEGEND

- BARRIER WALL
- PERIMETER GROUND WATER CONTAINMENT SYSTEM
- GRIFFITH LANDFILL BOUNDARY
- MW53 — LOWER AQUIFER WELL LOCATION AND DESIGNATION
- (621.76) — GROUNDWATER ELEVATION
- (NM) — NOT MEASURED
- 621.6 — GROUNDWATER ELEVATION CONTOUR BASED ON GROUNDWATER ELEVATION DATA

0 500 1000
SCALE IN FEET

NOTE GROUNDWATER ELEVATIONS FOR POTENTIOMETRIC SURFACE CONTOURS WERE MEASURED ON NOVEMBER 17, 2000

REV	DATE	BY	DESCRIPTION

DESIGNED CAS DATE 2/28/2001
CHECKED SAF DATE 3/5/2001
APPROVED PJV DATE 3/8/2001

SCALE AS SHOWN

MONTGOMERY WATSON
Chicago, Illinois

AMERICAN CHEMICAL SERVICES, INC.
NPL SITE
GRIFFITH, INDIANA

LOWER AQUIFER POTENTIOMETRIC SURFACE
NOVEMBER 2000

FIGURE 2

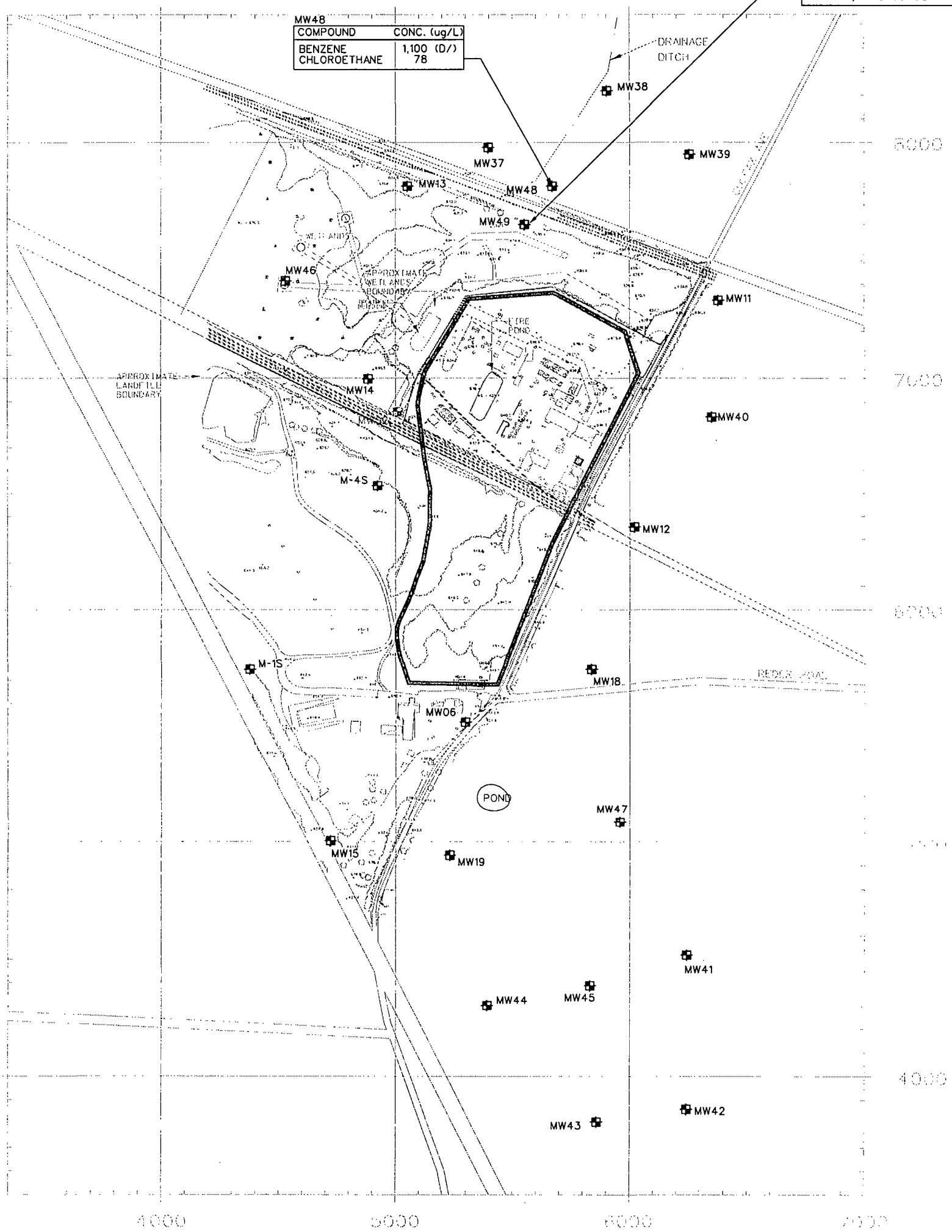
JOB No. 2090603 FILE: J:/209/0603 acs/november 2000/lower_contour3d.dgn

MW49

COMPOUND	CONC. (ug/L)
BENZENE	610 (D/)
CHLOROETHANE	190 (D/)
TRANS-1,2-DICHLOROETHANE	1 (J/)

MW48

COMPOUND	CONC. (ug/L)
BENZENE	1,100 (D/)
CHLOROETHANE	78



LEGEND

- UPPER AQUIFER WELL LOCATION AND DESIGNATION
- BARRIER WALL
- PERIMETER GROUND WATER CONTAINMENT SYSTEM
- ug/L MICROGRAMS PER LITER
- (J) INDICATES AN ESTIMATED VALUE (LAB/VALIDATED)
- (D) INDICATES SAMPLE WAS DILUTED (LAB/VALIDATED)
- ND NO VOC DETECTED

N

0 500 1000

SCALE IN FEET

REV	DATE	BY	DESCRIPTION

DESIGNED CAS 2/28/2001
CHECKED SAF 3/5/2001
APPROVED PJV 3/6/2001

SCALE: AS SHOWN

MONTGOMERY WATSON
Chicago, Illinois

AMERICAN CHEMICAL SERVICES, INC.
NPL SITE
GRIFFITH, INDIANA

VOCs DETECTED IN UPPER AQUIFER
MONITORING WELLS-NOVEMBER 2000

FIGURE 3

JOB No. 2090603 FILE: J:/209/0603 acs/november 2000/upper_spidy4d.dgn

REV	DATE	BY	DESCRIPTION

DESIGNED CAS DATE 2/28/2001
CHECKED SAF DATE 3/5/2001
APPROVED PJV DATE 3/6/2001

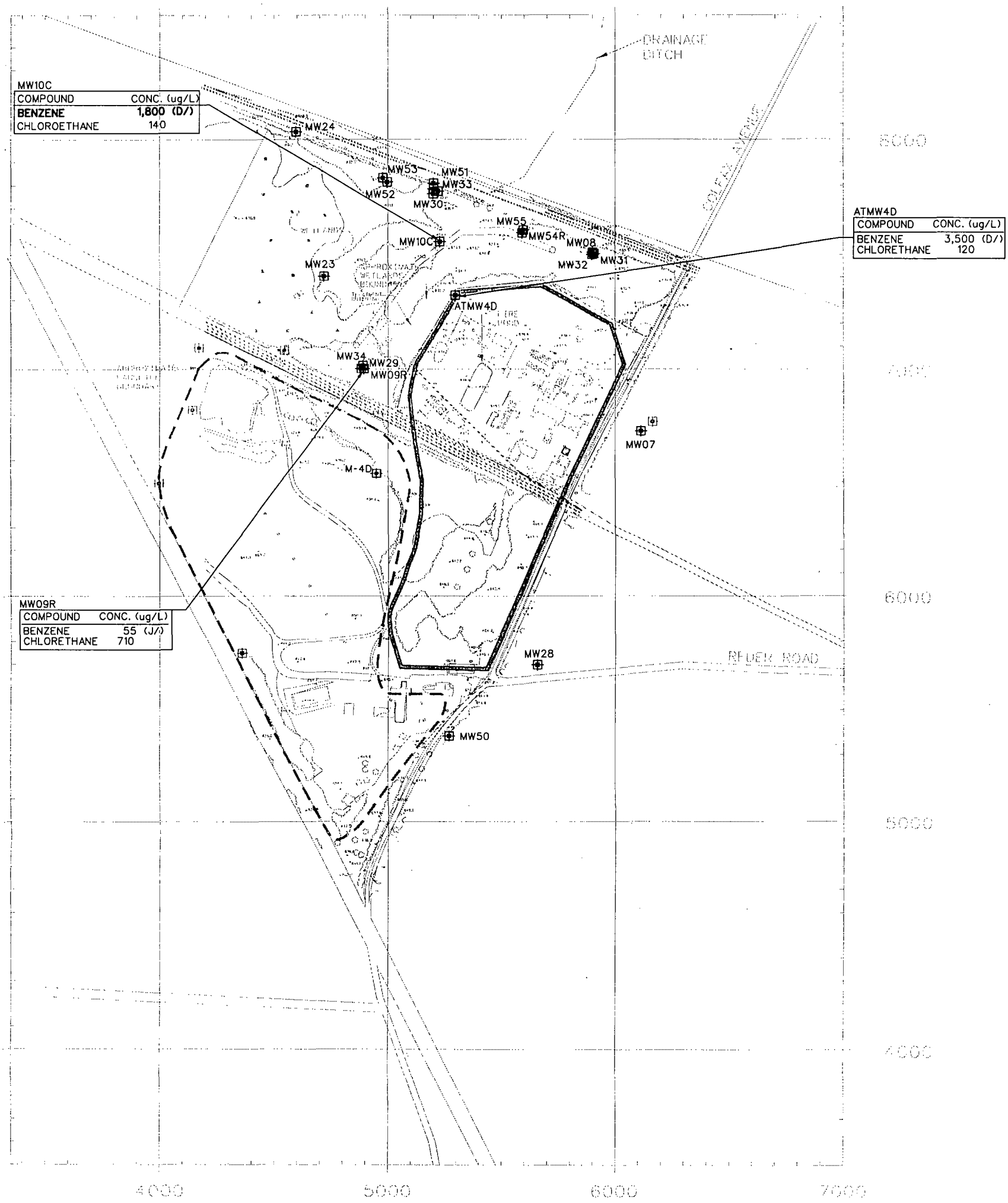
SCALE
AS SHOWN

MONTGOMERY WATSON
Chicago, Illinois

AMERICAN CHEMICAL SERVICES, INC.
NPL SITE
GRIFFITH, INDIANA

VOCs DETECTED IN LOWER AQUIFER MONITORING WELL - NOVEMBER 2000

FIGURE
4



NOTE: CONCENTRATIONS IN BOLD EXCEEDED BASELINE VALUES

JOB No. 2090603 FILE: J:/2090603 acs/november 2000/lower_spidy4d.dgn

APPENDIX A

COMPARISON OF NOVEMBER 2000 RESULTS TO BASELINE MAXIMUM CONCENTRATIONS

Comparison of Results to Baseline Highest Detections
November 2000
American Chemical Services NPL Site
Griffith, Indiana

Well	Analyte	Units	Highest Detect during Baseline	Current Event			
				Result	LQ	DQ	Detect Limit
ATMW-4D	1,1,1-Trichloroethane	UG/L			U		50
ATMW-4D	1,1,2-Trichloroethane	UG/L			U		50
ATMW-4D	1,1-Dichloroethene	UG/L			U		50
ATMW-4D	Benzene	UG/L		3,500	D		200
ATMW-4D	Chloroethane	UG/L		120			50
ATMW-4D	cis-1,2-Dichloroethene	UG/L			U		50
ATMW-4D	Tetrachloroethene	UG/L			U		50
ATMW-4D	trans-1,2-Dichloroethene	UG/L			U		50
ATMW-4D	Trichloroethene	UG/L			U		50
ATMW-4D	Vinyl chloride	UG/L			U	UJ	50
MW-09R	1,1,1-Trichloroethane	UG/L	200		U		100
MW-09R	1,1,2-Trichloroethane	UG/L	200		U		100
MW-09R	1,1-Dichloroethene	UG/L	200		U		100
MW-09R	Benzene	UG/L	310	55	J		100
MW-09R	Chloroethane	UG/L	2,900	710			100
MW-09R	cis-1,2-Dichloroethene	UG/L			U		100
MW-09R	Tetrachloroethene	UG/L	200		U		100
MW-09R	trans-1,2-Dichloroethene	UG/L			U		100
MW-09R	Trichloroethene	UG/L	200		U		100
MW-09R	Vinyl chloride	UG/L	200		U	UJ	100
MW-10C	1,1,1-Trichloroethane	UG/L	150		U		10
MW-10C	1,1,2-Trichloroethane	UG/L	150		U		10
MW-10C	1,1-Dichloroethene	UG/L	150		U		10
MW-10C	Benzene	UG/L	150	**1,800**	D		100
MW-10C	Chloroethane	UG/L	420	140			10
MW-10C	cis-1,2-Dichloroethene	UG/L			U		10
MW-10C	Tetrachloroethene	UG/L	150		U		10
MW-10C	trans-1,2-Dichloroethene	UG/L			U		10
MW-10C	Trichloroethene	UG/L	150		U		10
MW-10C	Vinyl chloride	UG/L	129		U	UJ	10
MW-48	1,1,1-Trichloroethane	UG/L	500		U		50
MW-48	1,1,2-Trichloroethane	UG/L	500		U		50
MW-48	1,1-Dichloroethene	UG/L	500		U		50
MW-48	Benzene	UG/L	9,500	1,100	D		100
MW-48	Chloroethane	UG/L	1,000	78			50
MW-48	cis-1,2-Dichloroethene	UG/L			U		50
MW-48	Tetrachloroethene	UG/L	500		U		50
MW-48	trans-1,2-Dichloroethene	UG/L			U		50
MW-48	Trichloroethene	UG/L	500		U		50
MW-48	Vinyl chloride	UG/L	500		U	UJ	50
MW-49	1,1,1-Trichloroethane	UG/L	500		U		10
MW-49	1,1,2-Trichloroethane	UG/L	500		U		10
MW-49	1,1-Dichloroethene	UG/L	500		U		10
MW-49	Benzene	UG/L	6,750	610	D		50
MW-49	Chloroethane	UG/L	715	190	D		50
MW-49	cis-1,2-Dichloroethene	UG/L			U		10

BOLD = Exceedance
NA = Not Applicable

CAS/cas/RDC/CAS
J:\209\0603 ACS\Databases\2000\ACS GW.mdb[rptNewResultsVOC]
2090603.030401

Comparison of Results to Baseline Highest Detections
November 2000
American Chemical Services NPL Site
Griffith, Indiana

Well	Analyte	Units	Highest Detect during Baseline	Current Event			
				Result	LQ	DQ	Detect Limit
MW-49	Tetrachloroethene	UG/L	500		U		10
MW-49	trans-1,2-Dichloroethene	UG/L		1	J		10
MW-49	Trichloroethene	UG/L	500		U		10
MW-49	Vinyl chloride	UG/L	500		U	UJ	10

BOLD = Exceedance
NA = Not Applicable

CAS/cas/RDC/CAS
J:\209\0603 ACS\Databases\2000\ACS GW.mdb[rptNewResultsVOC]
2090603.030401

Comparison of Results to Baseline Highest Detections
November 2000
American Chemical Services NPL Site
Griffith, Indiana

Well	Analyte	Units	Highest Detect during Baseline	Current Event			
				Result	LQ	DQ	Detect Limit
MW-09R	Arsenic	UG/L	6.8		U		3.4
MW-09R	Lead	UG/L	6.7		U		2.1
MW-48	Arsenic	UG/L	13		U		3.4
MW-48	Lead	UG/L	7.7		U		2.1
MW-49	Arsenic	UG/L	38	9.9	B		10
MW-49	Lead	UG/L	4.4		U		2.1

BOLD = Exceedance
NA = Not Applicable

CAS/cas/RDC/CAS
J:\209\0603 ACS\Databases\2000\ACS GW.mdb[rptNewResultsInorg]
2090603.030401

APPENDIX B

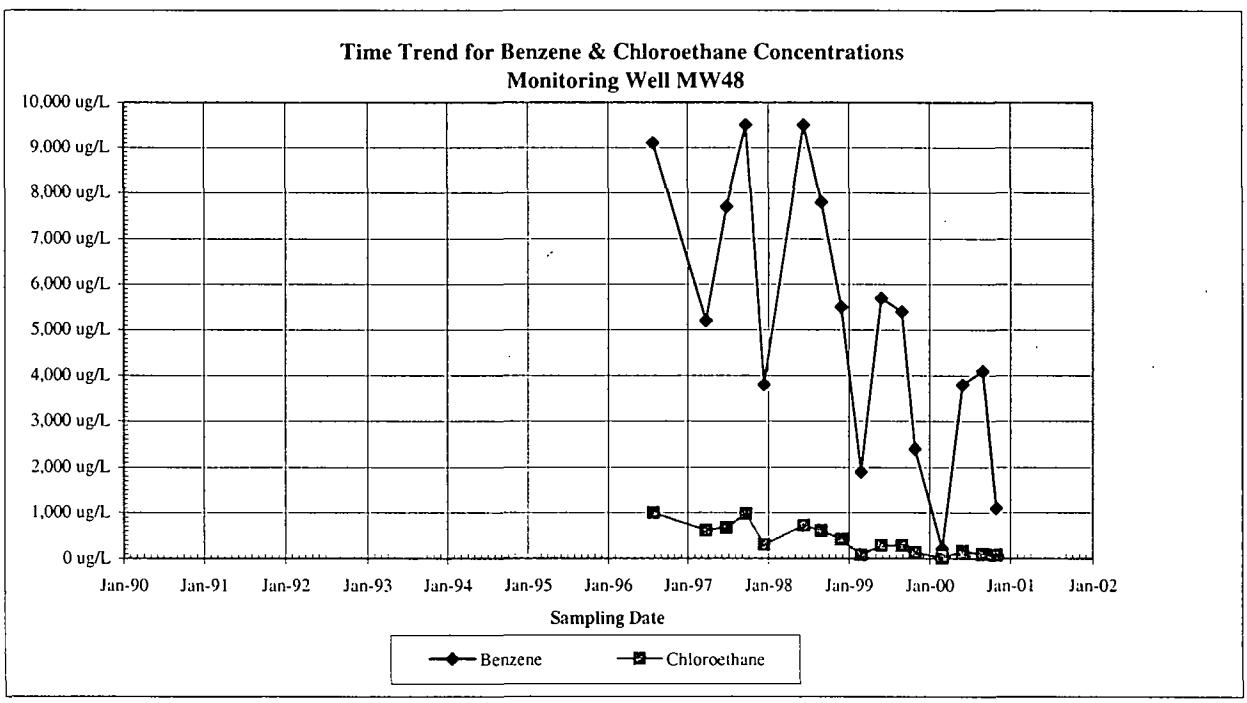
TIME TREND PLOTS

Baseline Groundwater Monitoring

ACS NPL Site

MW48

Date	Benzene	Chloroethane
Baseline	**9500**	**1000**
August-89		
May-90		
December-94		
August-96	9,100 ug/L	1,000 ug/L
March-97	5,200 ug/L	620 ug/L
June-97	7,700 ug/L	670 ug/L
September-97	9,500 ug/L	980 ug/L
December-97	3,800 ug/L	300 ug/L
June-98	9,500 ug/L	720 ug/L
September-98	7,800 ug/L	610 ug/L
December-98	5,500 ug/L	420 ug/L
March-99	1,900 ug/L	83 ug/L
June-99	5,700 ug/L	290 ug/L
September-99	5,400 ug/L	290 ug/L
November-99	2,400 ug/L	140 ug/L
March-00	220 ug/L	24 ug/L
June-00	3,800 ug/L	160 ug/L
September-00	4,100 ug/L	100 ug/L
November-00	1,100 ug/L	78 ug/L



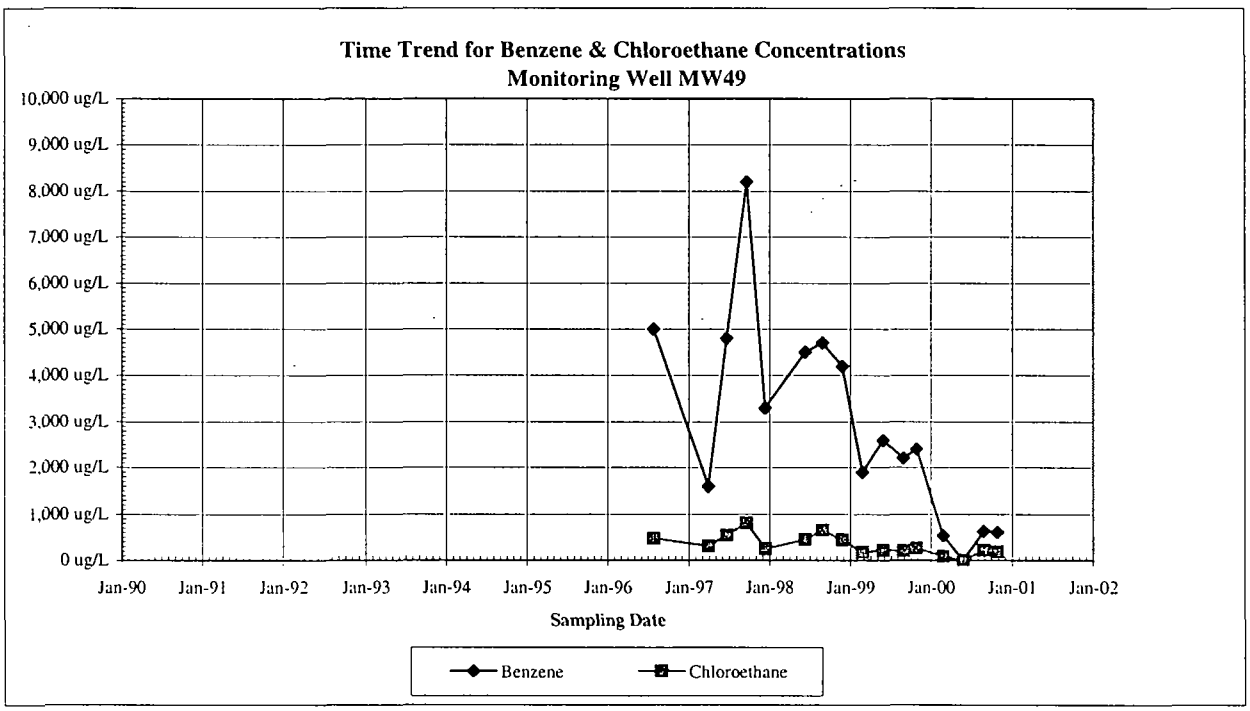
Upper Aquifer Monitoring Well: MW49

Baseline Groundwater Monitoring

ACS NPL Site

MW49

Date	Benzene	Chloroethane
Baseline	**6750**	**715**
August-89		
May-90		
December-94		
August-96	5,000 ug/L	480 ug/L
April-97	1,600 ug/L	310 ug/L
June-97	4,800 ug/L	540 ug/L
September-97	8,200 ug/L	810 ug/L
December-97	3,300 ug/L	250 ug/L
June-98	4,500 ug/L	450 ug/L
September-98	4,700 ug/L	650 ug/L
December-98	4,200 ug/L	440 ug/L
March-99	1,900 ug/L	180 ug/L
June-99	2,600 ug/L	220 ug/L
September-99	2,200 ug/L	210 ug/L
November-99	2,400 ug/L	260 ug/L
March-00	530 ug/L	91 ug/L
June-00	ND	ND
September-00	630 ug/L	220 ug/L
November-00	610 ug/L	190 ug/L



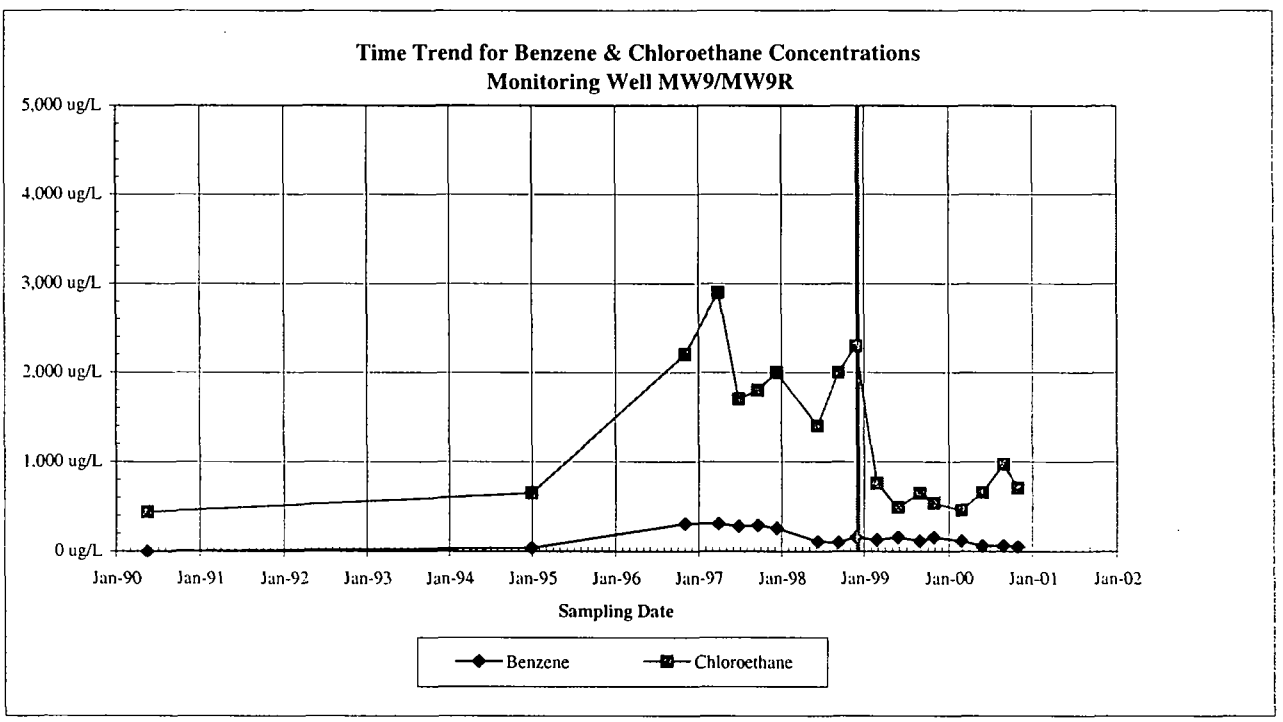
Lower Aquifer Monitoring Well: MW9/MW9R

Baseline Groundwater Monitoring
ACS NPL Site

MW9/MW9R

Date	Benzene	Chloroethane
BASELINE	**310**	**2900**
August-89		
May-90	BDL	440 ug/L
January-95	40 ug/L	650 ug/L
November-96	310 ug/L	2,200 ug/L
April-97	310 ug/L	2,900 ug/L
June-97	280 ug/L	1,700 ug/L
September-97	290 ug/L	1,800 ug/L
December-97	260 ug/L	2,000 ug/L
June-98	110 ug/L	1,400 ug/L
September-98	100 ug/L	2,000 ug/L
December-98	160 ug/L	2,300 ug/L
March-99	130 ug/L	760 ug/L
June-99	160 ug/L	490 ug/L
September-99	120 ug/L	650 ug/L
November-99	160 ug/L	540 ug/L
March-00	120 ug/L	460 ug/L
June-00	60 ug/L	660 ug/L
September-00	65 ug/L	970 ug/L
November-00	55 ug/L	710 ug/L

BDL = Below the Detection Limit



Line indicates change to replacement well

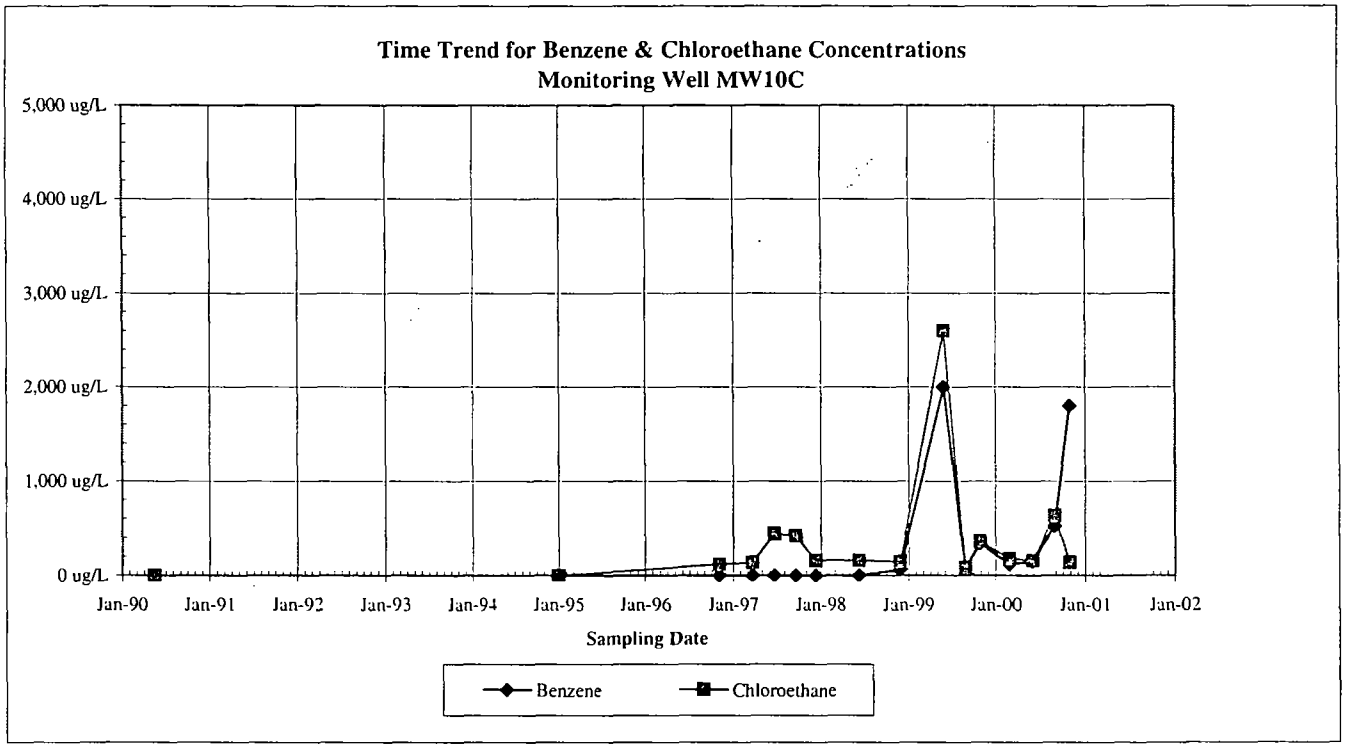
Lower Aquifer Monitoring Well: MW10C

Baseline Groundwater Monitoring
ACS NPL Site

MW10C

Date	Benzene	Chloroethane
BASELINE	**150**	**420**
August-89		
May-90	BDL	BDL
January-95	BDL	BDL
November-96	BDL	120 ug/L
March-97	BDL	140 ug/L
June-97	BDL	440 ug/L
September-97	BDL	420 ug/L
December-97	BDL	160 ug/L
June-98	BDL	160 ug/L
December-98	66 ug/L	150 ug/L
June-99	2,000 ug/L	2,600 ug/L
September-99	83 ug/L	88 ug/L
November-99	340 ug/L	360 ug/L
March-00	120 ug/L	180 ug/L
June-00	150 ug/L	160 ug/L
September-00	520 ug/L	630 ug/L
November-00	1,800 ug/L	140 ug/L

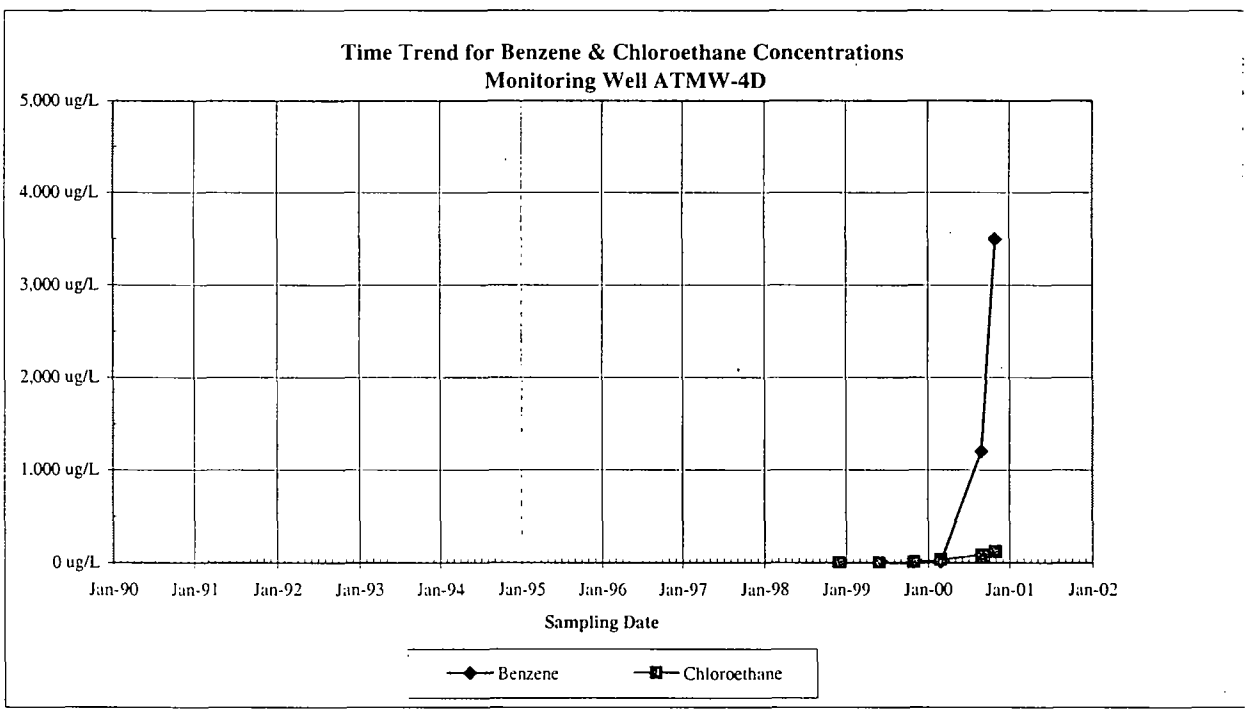
BDL = Below the Detection Limit



Baseline Groundwater Monitoring
ACS NPL Site

ATMW-4D

Date	Benzene	Chloroethane
Baseline	-	-
December-98	ND	ND
June-99	ND	ND
November-99	3 ug/L	9 ug/L
March-00	12 ug/L	34 ug/L
September-00	1,200 ug/L	88 ug/L
November-00	3,500 ug/L	120 ug/L



APPENDIX C

VALIDATION NARRATIVE AND LABORATORY REPORTS FROM UPPER AQUIFER

MEMORANDUM

MONTGOMERY WATSON

To: Chad Smith, MW-Chigaco
From: Matthew Reeder, MW-SLC

Date: December 20, 2000

Subject: Data Validation for American Chemical Service (ACS), Griffith, Indiana.

Job No.: 2090603.030401
SDG: D1201

INTRODUCTION

The following text is based on the validation of water samples collected at American Chemical Service, Inc. in November 2000.

CompuChem Laboratories (Cary, North Carolina) analyzed five samples and three QA/QC samples for the following parameters:

- SDG D1201 VOA, CLP-OLM 3.1, (samples: GWATMW4D-15, GWATMW4D-915, GWFB01-15, GWMW10C-15, GWMW48-15, GWMW49-15, GWMW9R-15, GWMWTB)
- SDG D1201 Arsenic and Lead, CLP-ILM 4.1, (samples: GWFB01-15, GWMW48-15, GWMW49-15, GWMW9R-15)

Data validation was conducted in accordance with procedures specified in *Pre-Design Activities Quality Assurance Project Plan (MW, 1995), USEPA Contract Laboratory Program Statement of Work for Organic Analysis OLM03.1(U.S. EPA August 1994), USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis Multi-Media Multi-Concentration ILM04.1 (U.S. EPA February 2000);* and was also based on principles outlined in *National Functional Guidelines for Organic Data Review (USEPA, 1994a),* and *National Functional Guidelines for Inorganic Data Review (USEPA, 1994b).*

The following field quality control samples were collected during the November 2000 sampling round:

- One trip blank (GWMWTB)
- One field blank (GWFB01-15)
- One field duplicate (GWATMW4D-915)

This memorandum contains a narrative summarizing the data quality objectives specified in the work plan.

SUMMARY

This section describes the quality control parameters reviewed during validation, summarizes the data quality objectives as a result of the validation and provides a summary of the deficiencies and qualification applied. The following paragraphs describe deficiencies that were identified which resulted in qualification of the sample results. Each analysis is separated into sections for clarity.

Volatile Organic Compounds

Major Deficiencies: There were no major deficiencies identified during the validation process.

Minor Deficiencies: The following paragraph describes the minor deficiencies that were identified during the validation process.

Continuing Calibration:
CCV recoveries exceeded 25%D requirement for vinyl chloride. No hits were found for this analyte for any of the samples, duplicate, or blanks. All the vinyl chloride results are qualified "UJ" for possible false negative results.

Metals

Major Deficiencies: There were no major deficiencies identified during the validation process.

Minor Deficiencies: There were no minor deficiencies identified during the validation process.

DATA QUALITY OBJECTIVES

The following is a summary of the data quality objectives that were evaluated during the data validation process.

Reporting Limits: Reporting limits were met for all analyses.

Accuracy

Laboratory Control Sample: Validation of the LCS was performed for inorganic analyses. The LCS for the inorganic analyses were within control limits and analyzed at the correct frequency. A LCS is not required for the VOC, SVOC, and Pesticides/PCB analyses in accordance with USEPA CLP SOW method OLM03.1 and OLM04.1.

Surrogates: The surrogate results were within laboratory specified limits.

Matrix Spike / Matrix Spike Duplicate: The MS/MSD results were within laboratory specified limits.

Precision

Field Duplicates: No results were qualified based on field duplicate comparisons. The attached table lists comparisons and RPD values.

Laboratory Duplicate Sample: The laboratory duplicate results were within laboratory specified limits without exception.

The overall results were acceptable, indicating that sampling and analytical precision objectives were met for the sampling event.

Completeness

The data package was complete for the requested analyses. No results were considered unusable. The completeness was 100 percent, which meets the completeness objective of 95 percent.

Representativeness:

The trip blank had no target analytes detected above the reporting limit, indicating that the representativeness objectives for the sampling event were met.

The field blank had no target analytes detected above the reporting limit, for all analyses, indicating that the representativeness objectives for the sampling event were met.

Comparability:

All data were reported in similar units to facilitate comparison of results within the data packages. Samples arrived at the laboratory at 6°C, which is within the limits of 2-6°C. All holding times were met, indicating that the comparability objectives for the sampling event were met.

CONCLUSION

As a result of this evaluation, all data within this SDG for wells at American Chemical Service are of known and acceptable quality in relation to the DQOs of this project. Data are considered usable as qualified for the intended purposes.

REFERENCES

Pre-Design Activities Quality Assurance Project Plan, American Chemical Service, Inc. NPL Site, Griffith Indiana (MW, 1995).

USEPA Contract Laboratory Program Statement of Work for Organic Analysis OLM03.1(U.S. EPA August 1994),

USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis Multi-Media Multi-Concentration ILM04.1 (U.S. EPA February 2000)

National Functional Guidelines for Organic Data Review (U.S. EPA, 1994a).

National Functional Guidelines for Inorganic Data Review (U.S. EPA, 1994b).

ACS-NPL March 2000
Field Duplicate Comparisons
SDG R1201, S1201, T1201, U1201

Parameter	Sample Result	Duplicate Result	RPD	Comments
SDG D1201	**GWATMW4D-15**	**GWATMW4D-915**		
Vinyl Chloride(ug/L)	<50	<200	NC	
Chloroethane(ug/L)	**120**	**87**	28%	
1,1-Dichloroethene(ug/L)	<50	<200	NC	
trans-1,2-Dichloroethene(ug/L)	<50	<200	NC	
cis-1,2-Dichloroethene(ug/L)	<50	<200	NC	
1,1,1-Trichloroethane(ug/L)	<50	<200	NC	
Benzene(ug/L)	**3500**	**3200**	9%	
Trichloroethene(ug/L)	<50	<200	NC	
1,1,2-Trichloroethane(ug/L)	<50	<200	NC	
Tetrachloroethene(ug/L)	<50	<200	NC	
Arsenic	**NA**	**NA**		
Lead	NA	NA		

NA Not analyzed
NC Not calculated

PJD
CHI1 Server J:/1252/042/March2000/Field Dupes.xls

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GWMW48-15

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-5

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-5A55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/29/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 5.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	50	U
75-00-3	Chloroethane	78	
75-35-4	1,1-Dichloroethene	50	U
156-60-5	trans-1,2-Dichloroethene	50	U
156-59-2	cis-1,2-Dichloroethene	50	U
71-55-6	1,1,1-Trichloroethane	50	U
71-43-2	Benzene	1100	E
79-01-6	Trichloroethene	50	U
79-00-5	1,1,2-Trichloroethane	50	U
127-18-4	Tetrachloroethene	50	U

1F

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

GWMW48-15

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-5

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-5A55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/29/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 5.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GWMW48-15DL

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-5

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-5DA55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/29/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 10.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	100	U
75-00-3	Chloroethane	70	DJ
75-35-4	1,1-Dichloroethene	100	U
156-60-5	trans-1,2-Dichloroethene	100	U
156-59-2	cis-1,2-Dichloroethene	100	U
71-55-6	1,1,1-Trichloroethane	100	U
71-43-2	Benzene	1100	D
79-01-6	Trichloroethene	100	U
79-00-5	1,1,2-Trichloroethane	100	U
127-18-4	Tetrachloroethene	100	U

1F

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.: GWMW48-15DL

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-5

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-5DA55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/29/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 10.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
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27.					
28.					
29.					
30.					

U. S. EPA - CLP

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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

GWMW48-15

Lab Name: COMPUCHEM Contract:

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix (soil/water): WATER Lab Sample ID: D1201-5

Level (low/med): LOW Date Received: 11/22/00

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	3.4	U		P
7439-92-1	Lead	2.1	U		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GWMW49-15

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-4

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-4B55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/28/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	210	E
75-35-4	1,1-Dichloroethene	10	U
156-60-5	trans-1,2-Dichloroethene	1	J
156-59-2	cis-1,2-Dichloroethene	10	U
71-55-6	1,1,1-Trichloroethane	10	U
71-43-2	Benzene	340	E
79-01-6	Trichloroethene	10	U
79-00-5	1,1,2-Trichloroethane	10	U
127-18-4	Tetrachloroethene	10	U

1F

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

GWMW49-15

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-4

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-4B55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/28/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 2 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	352-93-2	DIETHYL SULFIDE	12.58	6	NJ
2.	873-94-9	CYCLOHEXANONE, 3,3,5-TRIMETH	17.67	8	NJ
3.					
4.					
5.					
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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GWMW49-15DL

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-4

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-4D2A55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/29/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 5.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	50	U
75-00-3	Chloroethane	190	D
75-35-4	1,1-Dichloroethene	50	U
156-60-5	trans-1,2-Dichloroethene	50	U
156-59-2	cis-1,2-Dichloroethene	50	U
71-55-6	1,1,1-Trichloroethane	50	U
71-43-2	Benzene	610	D
79-01-6	Trichloroethene	50	U
79-00-5	1,1,2-Trichloroethane	50	U
127-18-4	Tetrachloroethene	50	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

GWMW49-15DL

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-4

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-4D2A55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/29/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 5.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

GWMW49-15

Lab Name: COMPUCHEM Contract:

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix (soil/water): WATER Lab Sample ID: D1201-4

Level (low/med): LOW Date Received: 11/22/00

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	9.9	B		P
7439-92-1	Lead	2.1	U		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GWFB01-15

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-1

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-1B55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/28/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-35-4	1,1-Dichloroethene	10	U
156-60-5	trans-1,2-Dichloroethene	10	U
156-59-2	cis-1,2-Dichloroethene	10	U
71-55-6	1,1,1-Trichloroethane	10	U
71-43-2	Benzene	10	U
79-01-6	Trichloroethene	10	U
79-00-5	1,1,2-Trichloroethane	10	U
127-18-4	Tetrachloroethene	10	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

GWFB01-15

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-1

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-1B55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/28/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

GWFB01-15

Lab Name: COMPUCHEM Contract:

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix (soil/water): WATER Lab Sample ID: D1201-1

Level (low/med): LOW Date Received: 11/22/00

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	3.4	U		P
7439-92-1	Lead	2.1	U		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GWTB01-15

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-8

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-8B55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/28/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	10	U
75-35-4	1,1-Dichloroethene	10	U
156-60-5	trans-1,2-Dichloroethene	10	U
156-59-2	cis-1,2-Dichloroethene	10	U
71-55-6	1,1,1-Trichloroethane	10	U
71-43-2	Benzene	10	U
79-01-6	Trichloroethene	10	U
79-00-5	1,1,2-Trichloroethane	10	U
127-18-4	Tetrachloroethene	10	U

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EPA SAMPLE NO.

GWTB01-15

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-8

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-8B55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/28/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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APPENDIX D

VALIDATION NARRATIVE AND LABORATORY REPORTS FROM LOWER AQUIFER

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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GWATMW4D-15

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-6

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-6A55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/29/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 5.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	50	U
75-00-3	Chloroethane	120	
75-35-4	1,1-Dichloroethene	50	U
156-60-5	trans-1,2-Dichloroethene	50	U
156-59-2	cis-1,2-Dichloroethene	50	U
71-55-6	1,1,1-Trichloroethane	50	U
71-43-2	Benzene	1900	E
79-01-6	Trichloroethene	50	U
79-00-5	1,1,2-Trichloroethane	50	U
127-18-4	Tetrachloroethene	50	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

GWATMW4D-15

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-6

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-6A55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/29/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 5.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GWATMW4D-15DL

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-6

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-6D2A55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/29/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 20.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	200	U
75-00-3	Chloroethane	97	DJ
75-35-4	1,1-Dichloroethene	200	U
156-60-5	trans-1,2-Dichloroethene	200	U
156-59-2	cis-1,2-Dichloroethene	200	U
71-55-6	1,1,1-Trichloroethane	200	U
71-43-2	Benzene	3500	D
79-01-6	Trichloroethene	200	U
79-00-5	1,1,2-Trichloroethane	200	U
127-18-4	Tetrachloroethene	200	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

GWATMW4D-15DL

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-6

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-6D2A55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/29/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 20.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GWATMW4D-915

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-7

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-7DA55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/29/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 20.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	200	U
75-00-3	Chloroethane	87	J
75-35-4	1,1-Dichloroethene	200	U
156-60-5	trans-1,2-Dichloroethene	200	U
156-59-2	cis-1,2-Dichloroethene	200	U
71-55-6	1,1,1-Trichloroethane	200	U
71-43-2	Benzene	3200	
79-01-6	Trichloroethene	200	U
79-00-5	1,1,2-Trichloroethane	200	U
127-18-4	Tetrachloroethene	200	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

GWATMW4D-915

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-7

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-7DA55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/29/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 20.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GWMW9R-15

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-2

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-2DA55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/29/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 10.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	100	U
75-00-3	Chloroethane	710	
75-35-4	1,1-Dichloroethene	100	U
156-60-5	trans-1,2-Dichloroethene	100	U
156-59-2	cis-1,2-Dichloroethene	100	U
71-55-6	1,1,1-Trichloroethane	100	U
71-43-2	Benzene	55	J
79-01-6	Trichloroethene	100	U
79-00-5	1,1,2-Trichloroethane	100	U
127-18-4	Tetrachloroethene	100	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

GWMW9R-15

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-2

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-2DA55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/29/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 10.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 0 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
4.					
5.					
6.					
7.					
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INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

GWMW9R-15

Lab Name: COMPUCHEM Contract:

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix (soil/water): WATER Lab Sample ID: D1201-2

Level (low/med): LOW Date Received: 11/22/00

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7440-38-2	Arsenic	3.4	U		P
7439-92-1	Lead	2.1	U		P

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GWMW10C-15

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-3

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-3B55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/28/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume:_____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	10	U
75-00-3	Chloroethane	140	
75-35-4	1,1-Dichloroethene	10	U
156-60-5	trans-1,2-Dichloroethene	10	U
156-59-2	cis-1,2-Dichloroethene	10	U
71-55-6	1,1,1-Trichloroethane	10	U
71-43-2	Benzene	430	E
79-01-6	Trichloroethene	10	U
79-00-5	1,1,2-Trichloroethane	10	U
127-18-4	Tetrachloroethene	10	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

GWMW10C-15

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-3

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-3B55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/28/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 3 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		UNKNOWN	7.62	810	J
2.		UNKNOWN	9.24	0	
3.	123-91-1	1,4-DIOXANE	12.99	7	NJ
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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GWMW10C-15DL

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-3

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-3D2A55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/29/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 10.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
75-01-4	Vinyl Chloride	100	U
75-00-3	Chloroethane	140	D
75-35-4	1,1-Dichloroethene	100	U
156-60-5	trans-1,2-Dichloroethene	100	U
156-59-2	cis-1,2-Dichloroethene	100	U
71-55-6	1,1,1-Trichloroethane	100	U
71-43-2	Benzene	1800	D
79-01-6	Trichloroethene	100	U
79-00-5	1,1,2-Trichloroethane	100	U
127-18-4	Tetrachloroethene	100	U

1F

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

GWMW10C-15DL

Lab Name: COMPUCHEM Contract: OLM04-REVS

Lab Code: LIBRTY Case No.: SAS No.: SDG No.: D1201

Matrix: (soil/water) WATER Lab Sample ID: D1201-3

Sample wt/vol: 5 (g/mL) ML Lab File ID: D1201-3D2A55

Level: (low/med) LOW Date Received: 11/22/00

% Moisture: not dec. _____ Date Analyzed: 11/29/00

GC Column: EQUITY624 ID: 0.53 (mm) Dilution Factor: 10.0

Soil Extract Volume: _____(uL) Soil Aliquot Volume: _____(uL)

Number TICs found: 1 CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	60-29-7	ETHER	7.62	1500	NJD
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
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29.					
30.					